

## **NERRS Science Collaborative Progress Report for the Period 3/1/2011 through 9/1/2011**

**Project Title:** Assessing Coastal Uplift and Habitat Changes in a Glacially Influenced Estuary System Located in Kachemak Bay, Alaska

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### **A. Progress Overview**

Understanding the balance of the conflicting forces of land and sea-level rise is important to the communities surrounding Kachemak Bay, which depend on near-shore fisheries for food and safe harbor infrastructure for transportation. A goal of our project is to provide scientific data to community leaders regarding how land and sea-level changes may impact community services and local ecology. This study builds upon existing work on coastal processes developed by the University of Alaska, Fairbanks (UAF) and monitoring and mapping of salt marsh habitats by the Kachemak Bay National Estuarine Research Reserve (KBNERR). In this study, we will model land and sea-level changes in the Kachemak Bay region based on intensive data collection with high precision global positioning system (GPS) instruments. Much of the infrastructure for the city of Homer is not on bedrock, and may have a different rate of change than bedrock sites. Salt marsh plants range from fresh water to salt tolerant plants in the vegetation community structure and provide a sensitive indicator of sea-level rise. We will develop a long-term monitoring program of emergent vegetation in select salt marshes in Kachemak Bay. When paired with the GPS data, mapped vegetation plant communities provide valuable information on relative shifts in sea-level rise and land-level change over time. In our region, coastal uplift is due to after-effects from the 1964 earthquake, the steady buildup of strain for the next big earthquake (strain accumulation), and rapid melting of heavy ice contained in local glaciers and ice fields (isostatic rebound). Melting glaciers also contribute to local and global sea level rise.

Progress on this study has been insightful and interesting during this reporting period. We held two Core Intended User (CIU) meetings with our collaborators on the study (16 March and 1 June 2011). In March, our Coastal Zone Management representative, Gary Williams presented on coastal erosion and land use planning issues in our region. In June, our Harbor Master presented on dredging and sedimentation issues in the Homer Harbor. In July, we held a Discovery Lab about all aspects of our Science Collaborative study for the general public (320 people attended over a 3-day period).

We accomplished the following field work during this reporting period: installed a third Continuously Operating GPS Reference Stations (CORS) in Petersen Bay, set the infrastructure for all four salt marsh sites (permanent transects, soil, water, and barometric loggers, and vertically stable benchmarks), developed a database structure for the study, completed the majority of the vegetation monitoring, conducted a citizen science training session (15 people) and monitored the biological diversity of two of the four salt marsh sites, and began GPS monitoring of vertically stable benchmarks in our region.

## **B. Working with Intended Users:**

- **Describe the progress on tasks related to the integration of intended users into the project for this reporting period.** We are finding that having our core intended users present at the quarterly meetings is very informative to all participants. The presentations provide the researchers and the integration lead a much better idea of what the issues and challenges are to integrating science into their jobs. The presentations made by CIUs also provide for thoughtful discussions about the strengths and limitations of the relevant laws and agency practices we work within and often results in more ideas generated for information needs. During the reporting period, we held two CIU meetings with our collaborators on the study (16 March and 1 June 2011). In March, our Coastal Zone Management representative, Gary Williams presented on coastal erosion and land use planning issues in our region. We circulated a report from North Carolina on regional sea level rise written for coastal decision makers and got feedback from the CIUs about the utility of the report content. Participants found the information delivery useful and relative to their needs, thus supported the idea of this Science Collaborative project utilizing a similar format for our end-of-the-study reporting purposes. When group feedback was requested regarding their openness and availability to do meeting 'homework', it was suggested that a synopsis of any reading material be provided prior to discussion. In June, our Harbor Master presented on dredging and sedimentation issues in the Homer Harbor.
- **What did you learn? Have there been any unanticipated challenges or opportunities?** We have been learning that scientific results are not always easy to incorporate in management decisions because there are often conflicting views in the profession. For scientists, this is normal but for decision makers it is troubling especially if a decision ends up in litigation. We are still exploring ways to outreach the scientific method with our group. One challenge we have had is getting all of our core intended users to the meetings and we discussed this at our last meeting. When asked for feedback about the frequency and content of our CIU meetings, those in attendance did not propose changes and were supportive of our present efforts. It was determined that lack of full attendance did not reflect disinterest, but rather that things come up and peoples' schedules are busy.
- **Who has been involved?** The principal investigators and the CIUs have all been involved. Additional users of the data were contacted and notified of upcoming Science Collaborative meetings and outreach events. Fifteen Citizen Scientists were recruited and trained during this reporting period. We have also been gifted a TIDES student, Kenny Daher, who has been instrumental in all aspects of implementing the field work and has

contributed much to the citizen science component of our project in the month he has been here. Kenny has been conducting interviews with people attending our public Discovery Lab on the Science Collaborative project as well as interviews with people we trained as part of the Citizen Science monitoring of the biological diversity in the salt marshes.

- **Has interaction with intended users brought about any changes to your methods for integration of intended users, the intended users involved, or your project objectives?** Thus far, no changes to the methods or sampling have been recommended by our CIU.
- **How do you anticipate working with intended users in the next six months?** In the next six months, we will continue our scheduled quarterly core intended user meetings. We additionally hope to engage our intended users in video vignettes about this project. This involves conducting and videotaping interviews that will help tell the story of the background need of this project (how it came to be), the benefits of citizen science, and the collaborative learning experience.

### **C. Progress on project objectives for this reporting period:**

- **Describe progress on tasks related to project objectives for this reporting period.** Below are some of the tasks we are planning to accomplish and our progress in doing so.
  - a. Establish a long-term monitoring program to continue monitoring land and sea level changes over time in salt marshes
    - i. As part of the Biological monitoring initiative through NERRS, we evaluated plot retention in the Fox River Flats and Beluga Slough long-term monitoring sites
    - ii. We selected two additional long-term monitoring sites (China Poot and Sadie Cove), obtained permits from Alaska State Parks, Alaska Department of Fish and Game, and UNH's IACUC to conduct research and monitoring at these sites through sound scientific methods. UNH facilitated acquiring the necessary IACUC permits for the biological monitoring.
    - iii. We established permanent transects at all four salt marsh sites, instrumented multiple transects at site with soil temperature loggers (upper and lower marsh), water level loggers (upper and lower stream), and barometric loggers (one at each site).
    - iv. We established a third permanent CORS site at Petersen Bay. All three sites are actively collecting data and we are researching an additional site at the head of the Bay.
    - v. We established additional vertically stable benchmarks in China Poot and Sadie Cove salt marshes and on adjacent bed rock sites.
    - vi. We have monitored vegetation for the second year in Beluga Slough and for the first year in China Poot and Sadie Cove salt marshes (Fox River flats will be monitored for the second year in early September).

- b. Provide the local communities with a team of well-trained citizen scientists who will be able to participate in future monitoring activities with the Reserve
    - i. In July, we held a 2-hr Discovery Lab (during 27, 29, and 30 July) on our Science Collaborative project at the Alaska Islands and Ocean Visitor Center. The Discovery Lab covered a project overview, information on types of estuaries, salt marsh vegetation and monitoring methods, sea-level rise and social consequences, biological diversity in salt marsh habitats, benefits of community monitoring, and origami crane making. Collectively, we had 320 members of the public attend.
    - ii. During 27-28 July, we held two evening training sessions for citizen science monitoring of Beluga Slough (sampled 13 August) and China Poot (sampled 20 August) salt marshes. The training was mandatory prior to participating in the field activities and we had 15 committed volunteers for the project. We trained on how to fill out the data sheets, salt marsh plant identification and monitoring, and insect and infaunal invertebrate sampling methods.
  - c. Support our intended users of the information so that they know how to apply the information generated from the study and will be fluent in the ideas, methods, and terms that describe geological and biological changes which influence coastal uplift and sea level rise
    - i. See bi and bii on the Discovery Labs and citizen science monitoring
    - ii. Through help from UNH, we were able to have a web page that can be readily updated with project materials & resources
    - iii. Continued CIU meetings & highlighting projects and information needs.
- **Identify additional users of the information**
  - a. Additional participants for the CIU meeting were generated in the first meeting with follow-up suggestions provided via email correspondence.
  - b. Through our CTP programs and outreach of the science collaborative, we have been in contact with several regional efforts by federal, state, and private entities recording high precision GPS measures in proximity to our study areas.
  - c. Through Discovery Labs and outreach we communicate to a wide variety of potential users of this information
- **What data did you collect?**
  - a. We have three CORS sites collecting vertically stable positions in the Kachemak Bay area. We anticipate adding a fourth site in the next reporting period. We have begun monitoring benchmarks within our salt marsh sites with high-precision Global Positioning Units.
  - b. We developed and hosted two Discovery Labs (Science in the Field and Salt marshes) which provided an introduction of the project to potential citizen scientists.
  - c. We began developing story boards and conducting video interviews for multi-media outreach opportunities of this project.

- d. We held two training sessions for 15 citizen scientists to participate in monitoring the biological diversity in our salt marsh study sites.
  - e. We completed biological diversity sampling for two of the four salt marsh sites with our trained citizen science monitors.
  - f. We established benchmarks and permanent vegetation transects at all salt marsh sites and completed data collection for all permanent vegetation plots for Beluga Slough, China Poot, and Sadie Cove (Fox River Flats will be monitored during the first week of September) and we collected data from temperature, and water-level loggers. Sediment elevation changes will be determined in the next reporting period.
- **Has your progress in this period brought about any changes to your methods, the integration of intended users, the intended users involved or the project objectives?**
    - a. None to date
  - **Have there been any unanticipated challenges, opportunities, or lessons learned?**
    - a. None to date with the caveat that we are continually learning new lessons as we implement this study.
  - **What are your plans for meeting project objectives for the next six months?**
    - a. In the near term, we will be completing data collection on the permanent vegetation plots (Fox River Flats), downloading data from the water and temperature loggers, sorting through insects and infaunal invertebrates collected in the citizen science salt marsh monitoring, entering and error checking data and continuing the GPS campaigns in Kachemak Bay. We will also be researching and potentially installing a fourth CORS site at the head of the Bay. We will be initiating sediment elevation monitoring at all four salt marsh sites this fall.
    - b. We will have two more CIU meetings (see descriptions above) on 21 September and 7 December 2011 and we will have two KBNERR community council meetings.
    - c. We will develop and host a second Discovery Lab on ‘Our Changing Landscape’ which will provide additional information and outreach on this project.
    - d. We will continue to develop outreach materials based on our ongoing work.

**D. Benefit to NERRS and NOAA: List any project-related products, accomplishments, or discoveries that may be of interest to scientists or managers working on similar issues, your peers in the NERRS, or to NOAA. These may include, but are not limited to, workshops, trainings, or webinars; expert speakers; new publications; and new partnerships or key findings related to collaboration or applied science.**

- a. A major benefit to the NERRS is that KBNERR has acquired high-precision GPS and leveling equipment which meets the national program standards. This results in one less reserve needing to borrow the shared equipment.
- b. By setting up the long-term vegetation transects utilizing the national program’s methods, it ensures that these data will be compatible with NERRS protocols which is a benefit.
- c. By modeling sea and land-level changes with high precision, we are contributing valuable information to our partners in the National Park Service, U.S. Geological

Survey, and U.S. Fish and Wildlife Service who are currently relying on the SLAMM model for sea level rise without the benefit of land-level change.

- d. We are developing Discovery Labs as a training tool for the public and training citizen scientists.
- E. Describe any activities, products, accomplishments, or obstacles not addressed in other sections of this report that you feel are important for the Science Collaborative to know.**
- a. We have not identified any additional obstacles at this point.



Biological Diversity in Beluga Slough